

INSTRUCTIONAL SUPPORT VIEW

8.2 Technology Education, Engineering, Design, and Computational Thinking: Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. The Nature of Technology: Creativity and Innovation: *Technology systems impact every aspect of the world in which we live.*

GRADES 3-5

- **Comparison and Contrast** of various technological systems and their functions:
 - How do such systems make something easier?
 - How do such systems make something faster or more accurate?
 - How do such systems make something possible that is NOT possible without technology assistance?
- **Study and map** the changes in technology systems over time and the connections between those changes and historical, social, political and economic events and forces
- **Introduce** students to the constraints that may affect technological system development and use: disconnects between available materials and necessary functions; cost to produce the functionality greater than available resources to manufacture or create; environmental 'cost' of production; ethical, cultural and social 'costs' of production and use

Instructional Focus:

This is the beginning of “systems thinking”—the connection of parts of a larger whole, and the recognition of how pieces of familiar and new tools fit into larger sets of goals and aspirations for human achievement.

STRAND &
GRADE LEVEL
BAND

SCAFFOLDING SUPPORT

is in this bottom section

RUBRIC: VIEW #1

Standard 8.1 Strand A Rubric 3-5			
DISTINGUISHED	STRONG	MODERATE	PARTIAL
<p>WITH COMPLETE INDEPENDENCE, THE STUDENT CAN</p> <p>Digital learning and processes:</p> <ul style="list-style-type: none"> Choose a group of technology systems all of which are designed for some common purpose: increased speed or accuracy; completely new functionality; eliminating the need for human work and the like. Create a presentation that explains how these systems are alike and how they are different in each of the following areas: development, impact, function, utility Create a presentation for peers that traces changes in this particular area of technology (the one chosen above) over time, links those changes to the social, economic and political environment in which the technologies were developed, and explains the probable tradeoffs for each technology as social, environmental, production and use 'costs' are considered. 	<p>WITH ONLY OCCASIONAL ASSISTANCE, THE STUDENT CAN</p> <p>Digital learning and processes:</p> <ul style="list-style-type: none"> Choose TWO technology systems and create a presentation that compares these systems in two of the following areas: development, impact, function, utility Articulate for peers a detailed understanding of all four of these elements in one of the technology systems and explain what some of the necessary trade-offs were likely to have been in the design and development of this system 	<p>WITH CONSISTENT, REPEATED, FREQUENT ASSISTANCE, THE STUDENT CAN</p> <p>Digital learning and processes:</p> <ul style="list-style-type: none"> Demonstrate understanding by comparing (orally, in writing or in some other observable format) such elements as development, impact, function and utility (elements chosen by the teacher) across at least TWO technology systems assigned by the teacher Articulate for peers a basic understanding of each of those elements in one of the chosen technology systems 	<p>WITH SUBSTANTIAL AND SUSTAINED ASSISTANCE, THE STUDENT</p> <p>Digital learning and processes:</p> <ul style="list-style-type: none"> demonstrates limited understanding of elements such as development, impact, function and utility in an explanation of a single technology system struggles to compare any one of the elements across TWO technology systems articulates a basic understanding of only one or two of the elements in a technology system

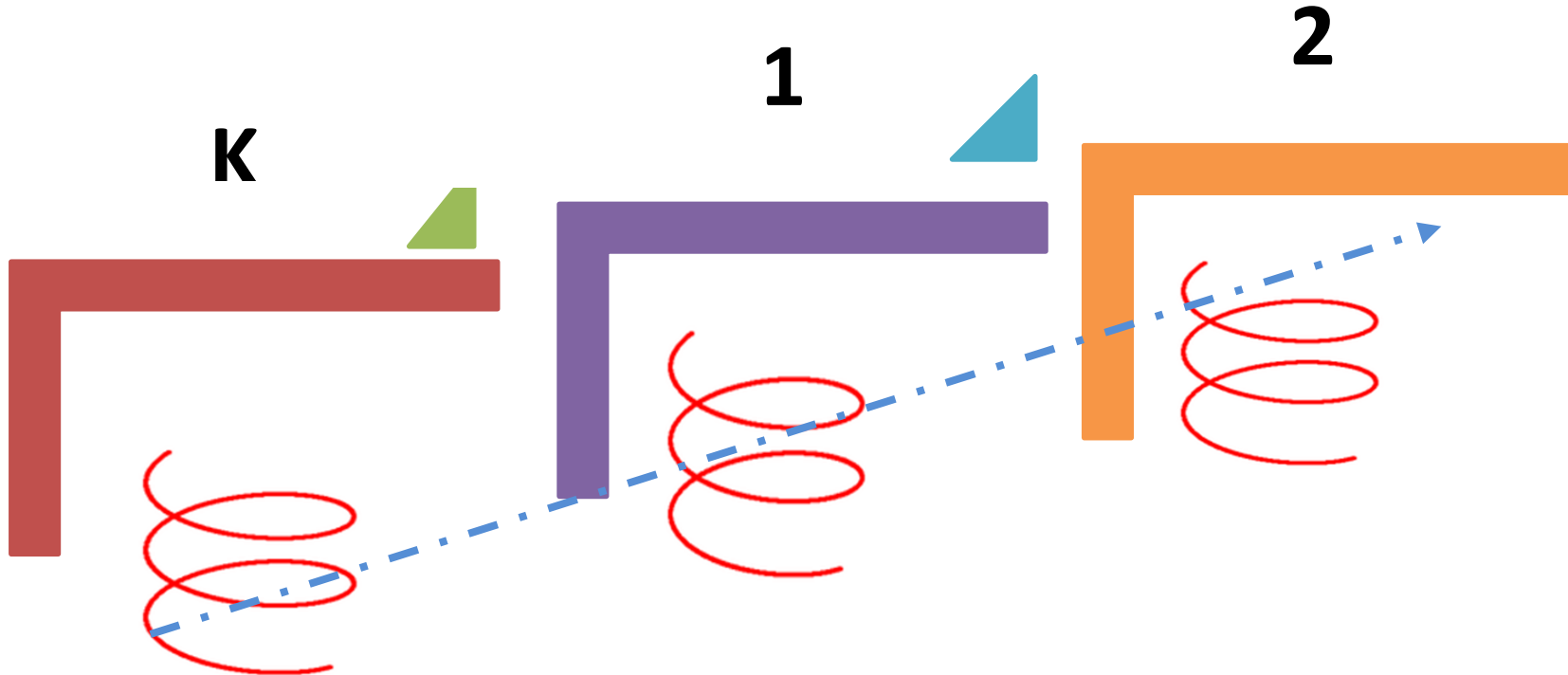
Demonstrations of student knowledge and skill that give evidence of their command of the particular elements of this strand of the standard

RUBRIC VIEW #2—The Checklist

Standard 8.2 Strand A 3-5					
Criterion: Demonstrate understanding of elements of technology systems					
OBSERVED BEHAVIOR/PERFORMANCE LEVEL	<i>Independently</i>	<i>Occasional Assistance</i>	<i>Frequent Assistance</i>	<i>Sustained Assistance</i>	NOTES
Compare elements chosen by the teacher across TWO technology systems assigned by the teacher					
Choose TWO technology systems and create a presentation that compares two of the following elements: development, impact, function, utility					
Choose a group of technology systems all of which are designed for some common purpose (increased speed or accuracy; completely new functionality; eliminating the need for human work and the like), and creating a presentation that explains how these systems are alike and how they are different in each of the following areas: development, impact, function, utility					
Criterion: Articulate for peers an understanding of elements of technology systems					
OBSERVED BEHAVIOR/PERFORMANCE LEVEL	<i>Independently</i>	<i>Occasional Assistance</i>	<i>Frequent Assistance</i>	<i>Sustained Assistance</i>	NOTES
A basic understanding of all chosen elements in ONE technology system					
A detailed understanding of all four of these elements in one of the technology systems, including an explanation of what some of the necessary trade-offs were likely to have been in the design and development of this system					
Create a presentation for peers that traces changes in the chosen area of technology over time, links those changes to the social, economic and political environment in which the technologies were developed, and explains the probable tradeoffs for each technology as social, environmental, production and use 'costs' are considered					

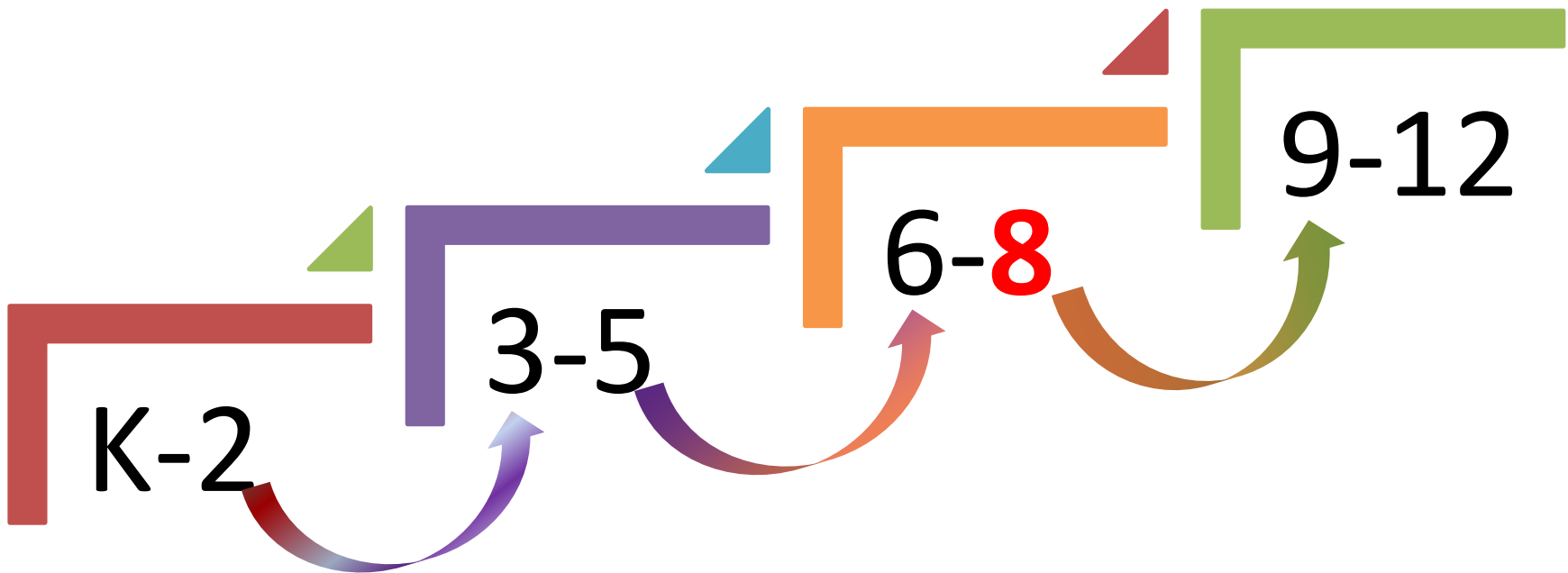
Within each grade band—

- The rubric describes the expected level of performance ***by the end of the grade band.***
- The expectation is that students across the 3-year span have repeated opportunities to learn and practice the skills and understandings in standards 8.1 and 8.2.
- Student learning is likely to be more of a spiral within a grade band, as students incorporate new learning and adjust to increased expectations.



Standards 8.1 and 8.2 : Steps to Mastery

- By the end of each grade band, students should be ready to engage the initial learning challenges of the next grade band.
- By the end of **Grade 8**, all students are expected to achieve the 'Moderate' level of all aspects of the 8.1 and 8.2 rubrics.



Pedagogical Observations for using the S8AT Toolkit

1. **Standards 8.1 and 8.2** focus largely on ways of thinking and analyzing almost anything in the human experience. Twenty-first century technology has made it possible for students to learn and apply unparalleled amounts and types of new knowledge across all subject areas. While parts of Standards 8.1 and 8.2 focus explicitly on students' command of technology-based tools, facility with the tools themselves is never an end in itself. Rather, it is necessary to link command of the Standard 8.1 and 8.2 tools with the ability to accomplish more challenging and sophisticated kinds of work in all areas of study.
3. The **Instructional Design Support documents** include scaffolding for each strand of Standards 8.1 and 8.2 that suggests some instructionally useful ways to interpret the goals of the standards—this scaffolding is intended to be suggestive, not exhaustive. Teachers are encouraged to think of many other ways these standards can be implemented through their instructional designs in any subject area.
4. The **S8AT rubrics for Standards 8.1 and 8.2** are written to articulate what students should know and be able to do at the end of a grade band. No single activity or assignment could possibly encompass all of the features of any one of the rubrics for even a single strand of Standards 8.1 and 8.2.
 - a. The S8AT rubrics assume that students will have multiple repeated assignments and activities that build toward mastery across the grades in each grade band.
 - b. The Checklist form of each rubric is designed to be used over and over again, so that each student's mastery of individual parts of a strand, as well as each student's growing independence is recorded.
5. It is important to note that as the **level of performance** (within a grade band, within a strand) for each 8.1 and 8.2 rubric shifts from moderate to strong and strong to distinguished, two things change:
 - a. The actual activities or assignments or performances the student completes are more challenging and complex.
 - b. The independence with which the student accomplishes the work of learning also increases.
6. **K-2 teachers** should note that the rubrics for this grade band differ slightly from the rubrics for all other grade bands. Appropriate developmental expectations for student learning are reflected in the K-2 rubrics, which have fewer performance levels and, in

some cases, simply an observation checklist which allows the teacher to record the student's gradual demonstration of skills and understandings.

7. Part of the **goal of these rubrics** is to reinforce the idea that students need to be led to take responsibility for their own learning. At the highest level of performance, regardless of grade band, the expectation is that students assume a major amount of control for their own work, their own learning, and their own evaluation of their progress and their needs for assistance, resources, and the like.
8. Some students do not currently have the skillset required to be measured by the S8AT rubrics. A tool was developed to measure performance for these students so that a measure of growth toward meeting Standards 8.1 and 8.2 is available for all students. The **Student Readiness Rubric** is a resource that has two purposes:
 - a. It can be used to assess skills students may need prior to being able to be evaluated and scored using the recommended Standard 8.0 Assessment Rubrics and Checklists. If a student does not score at a level three (3) or above on the Student Readiness Rubric, the student may need additional or supplementary support and services to attain the appropriate skills for the tasks and understandings articulated in Standards 8.1 and 8.2. With the necessary support, the student can attain over time all of the skills necessary to achieve, *at a minimum* the “Moderate” score level on the recommended Standard 8.0 rubrics.
 - b. If a student does not reach Level 3 on the Readiness Rubric, then this rubric should be used instead of the S8AT rubric to evaluate his or her work as the necessary skills are gained to attain the level three of this rubric. The student should continue to increase his or her skills toward “moderate” performance to be evaluated with the S8AT rubric.

FINAL NOTE:

One useful way to think about Standard 8 is to look carefully at one particular strand, Standard 8.2C. In this strand, the purposeful analysis of steps in any process to accomplish any goal or set of goals is the focus. The conscious and deliberate design process (analysis, trial and error, assessment and redesign, more trials and revision) is a uniquely human capability, and fostering this capability in all students is a critical part of education in the 21st century.

Standard 8, the technology standard, offers teachers a path to incorporate this kind of deliberative thinking into much of what students do in order to learn how to read and understand in any subject, write convincingly across the curriculum, and use mathematics and science to understand how things work or might work better.